TO:

Sir Bruce Fraser, K.C.B., Permanent Secretary,
Ministry of Health
T. D. Haddow, Esq., C.B., Secretary,
Department of Health for Scotland *

Introduction

Sirs,

1. We were appointed in January, 1961, with the following terms of reference:—

" To consider the nature of the work at present done by hospital engineers, their gradings, training and qualifications, and to make recommendations on—

(*a*) what changes, if any, are needed in the interests of the efficiency of the hospital engineering services; and

(*b*) whether facilities should be provided for the training of hospital engineers, and if so, what form such facilities should take. "

2. The terms of reference were broad enough for us to consider aspects beyond those of training, grading and qualifications, and several of the recommendations which we make bear on the organization of the engineering services.

3. We have met on 32 occasions, mostly for a full day, including visits to a number of hospitals in pursuit of our examination of the problems; the hospitals visited included both general and mental, teaching and non-teaching hospitals in England, Wales and Scotland. We discussed the engineering services with engineering, administrative and medical staff of hospital authorities, as well as with members of Hospital Management Committees and Boards of Governors; everybody was very helpful, and we wish to record our appreciation of the facilities and hospitality afforded us everywhere.

4. We invited a number of organizations to contribute their views on matters within the terms of reference; a list of those who submitted written evidence, which in many cases was supplemented by oral discussion, is at Appendix A. We have also had the benefit of the personal views and advice of individual engineering, administrative and medical members of the hospital service (as distinct from the views of organizations) and the readiness with which views were expressed was a measure of the general concern about the present and future efficiency of the hospital engineering services. We are grateful both to organizations and individuals for their co-operation.

5. Our report is divided into three sections: in Section I we review the current situation and indicate the problems which seem to us to arise from the present position and future developments; in Section II we give an account of the basic general considerations which have led to our detailed recommendations on grading, qualifications and training, which are to be found in Section III.

6. We wish to record our great appreciation of the competence of our Secretary. His unfailing cheerfulness and tact played a large part in creating the friendly atmosphere which characterized our meetings.

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*—*now* Scottish Home and Health Department.

Section I—Present Situation and its Problems

7. There have been radical changes in recent years in both the engineering content and complexity of engineering plant and installations in hospitals and further changes will undoubtedly occur as the development of new techniques in both engineering and medical fields makes greater demands on the engineering services. Not only must the hospital engineer have the requisite technical knowledge and experience to maintain existing services and installations, to renew plant and equipment and to understand and apply new technical developments to his field, but he must also have the administrative and managerial ability to plan and administer all aspects of the engineering services, including the control of operational and maintenance staff. Moreover, since Regional Hospital Boards have been increasingly delegating to Superintendent Engineers of hospital groups the task of design and execution of minor capital works, and the supervision of engineering capital works of larger scope, the hospital engineer's responsibilities have further widened.

8. A large proportion of Superintendent Engineers is approaching retiring age and from the evidence given to us it is clear that more than half of those at present in post will have left in the next ten years. Furthermore, nearly half of the Senior Engineers will retire during the same period and many of the others have neither the training nor experience required to fit them for promotion to a higher grade in a progressive hospital service. A further matter of concern is that the hospital service is failing to recruit and retain in sufficient numbers younger engineers having both the technical and managerial potential to make good Superintendent Engineers.

9. Existing services are, in our opinion, being so maintained that major breakdowns are infrequent, but with rare exceptions little is being done to improve the efficiency of the services and to develop plant and equipment. We consider that this situation prevails because of inadequate technical knowledge and lack of managerial initiative on the part of many engineers. Although we realize that shortage of money has been a discouragement, we believe that there has been a failure to make the best use of the money available.

10. Thus the two main problems are—

(*a*) to attract and retain capable engineers in competition with industry and with other public services; and

(*b*) to provide organized training for the special requirements of the hospital engineering service, including management procedures and administration.

11. An ambitious young man will only enter the hospital engineering service if he can see in it a rewarding career, having regard to the interest of the work and the prospects of advancement; failure in this regard is the main reason why recruitment of young men has been largely unsuccessful. We think that the radical changes in hospital engineering which have taken place in recent years have gone unrecognized, and that the scope and interest of the duties of a hospital engineer are largely unappreciated—few people, for instance, realize that the engineering capital assets in a modern hospital may amount to several million pounds, comprising plant and services of wide variety and complexity.

12. One of our main tasks, therefore, has been to devise a career structure which will attract the young men whom the hospital service needs to recruit. To do this we have had to inform ourselves of the duties of engineers at Regional Hospital Boards and their relationship with hospital engineers. We recognize, of course, that Regional Hospital Board engineers do not come within our terms of reference and therefore our recommendations are necessarily confined to matters directly affecting hospital engineers; nevertheless, we must record that in our view the logical long-term aim should be to establish a homogeneous and integrated engineering service, all hospital engineers coming under the professional direction of the Regional Engineer. We recognize that this would require fundamental changes in the organization of the National Health Service.

Section II—General Consideration

13. The primary functions of the hospital engineer and his staff are the operation and maintenance of the hospital engineering services, and we are convinced that this must remain so. Naturally, different duties and responsibilities fall to the different grades; the time of a Superintendent Engineer, for instance, should be mainly spent in planning, organizing and administering, whilst an Assistant Engineer has fewer organizational responsibilities and should spend much of his time directing and supervising the craftsmen who carry out maintenance and the men who operate the various service plants. Much confusion is caused because many laymen regard all the engineering staff as " engineers " and at times inefficiency results because they do not appreciate that the operation and maintenance of engineering services are team jobs calling for the technical knowledge and administrative ability of the engineer and the manual skills of the craftsman and operator.

14. The extent of the functions and responsibilities of the hospital engineer is insufficiently understood: he carries the responsibility for the correct and efficient operation and maintenance of a very large amount of costly plant, services and equipment, the greater proportion of which is in use (or which may require to be brought into use instantly) twenty-four hours a day and every day of the year; in general, there are no week-end or annual holiday periods to facilitate maintenance. Correct operation and maintenance are essential to meet the rapidly advancing and exacting demands for the control of physical and physiological conditions, procedures and processes. This trend will receive a considerable impetus as the result of building the new hospitals envisaged in the recently announced Hospital Plan; plant, services and equipment in a modern hospital embody in their design almost every branch of engineering science and technology.

15. In considering the appropriate training and qualifications for hospital engineers, we have constantly kept in mind these functions of operation and maintenance. Nothing, in our view, should be allowed which might encourage hospital engineers to regard operation and maintenance as not having the first claim on their time and energy or distract them from these functions. Nevertheless we recognize that both for the present and for the foreseeable future the engineering design staffs of Regional Hospital Boards will be unable to undertake all works of a capital nature in their Regions and that in these circumstances they will look to hospital engineers to carry out the less costly and complex

works, particularly the replacement of plant and equipment. Provided that this does not interfere with the primary functions of operation and maintenance we see no objection to this practice, and, indeed, there is some advantage in it in so far as such capital work tends to diversify the work of hospital engineers and thereby make it more attractive.

16. However, there are three conditions which should be satisfied before a hospital engineer is given responsibility for a particular capital work:—

(*a*) the Regional Engineer should satisfy himself that the particular hospital engineer is fully competent to undertake the work in question;

(*b*) capital work should only be delegated to the hospital engineer if in the opinion of both the Regional Engineer and the Hospital Management Committee or Board of Management this can be done without detriment to his operation and maintenance functions; and

(*c*) the capital work given him does not involve the employment of technical design staff.

In every case, of course, the approval of the Hospital Management Committee or Board of Management should be a condition of delegation.

17. What we have said above does not necessarily apply to teaching hospitals in England and Wales, which do not come under a Regional Hospital Board and are responsible for their own capital programmes. In such cases, the chief engineer of the hospital often has responsibility for major as well as minor capital works and a higher calibre of engineer may well be required. This question is referred to again in Section III.

18. It is recognized in the current Whitley Council agreement that a hospital engineer may be given the task of " assisting in the site supervision of such engineering capital works as he may be asked by the Regional Hospital Board, with the approval of the Hospital Management Committee, to supervise. " This, in our opinion, is a sensible practice and should be adopted whenever possible, for we believe that there should be the closest possible association of design, installation, and operation and maintenance in engineering and it is a way in which the design function of the Regional Hospital Board engineer and the operation and maintenance function of the hospital engineer can be linked to the benefit of the hospital service.

19. In considering the duties of hospital engineers we could not ignore the wide difference in practice which exists regarding responsibility for building maintenance. Many hospital groups employ Building Supervisors; others do not, even though they may qualify for one, in which case it is generally accepted that the Superintendent Engineer should be responsible to the hospital authority for building maintenance. We accept that this is reasonable, provided the Superintendent Engineer be given adequate building staff to fulfil this function. It is in those cases, now in the majority, where hospital groups have appointed Building Supervisors that the responsibility of Superintendent Engineers concerning building matters is controversial. We have heard conflicting views, persuasively presented. The kernel of the problem is undoubtedly the question of co-ordinating the building and engineering functions; from one side it is argued that co-ordination can only be fully efficient where there is one man in overall

charge who can utilize works staff to their best advantage and assess priorities on competing claims; from the other we learn that there is no difficulty about co-ordinating the separate building and engineering departments. We note that the present Whitley Council agreement (P.T.B. Circular 101) does not stipulate to whom a Building Supervisor is responsible, but leaves the question of overall responsibility for building work to be determined locally. We would not disguise the fact that there have been differences of opinion among ourselves on this question of responsibility for building maintenance; but we are agreed that where a Superintendent Engineer is given overall responsibility for both departments, this should be confined to securing co-ordination, and that the Building Supervisor should have full technical and managerial responsibility for his own department. We note that a Ministry Organisation and Methods team is currently examining the measures which can be taken to secure maximum co-ordination between the two departments where the Superintendent Engineer is not charged with this task.

20. We have also considered a suggestion that there would be advantage in having within the engineer's department a division of the mechanical and electrical services of a hospital group, with specialist electrical engineer posts in the Senior and Assistant grades. We do not favour this idea, for we consider it highly desirable that the mechanical and electrical work should be integrated and that one man should be responsible for all aspects of hospital engineering. It follows that the man with mechanical engineering qualifications should have had electrical engineering training as well, and vice-versa; we note that this is already provided for by the endorsement to the appropriate National Certificate which is specified under the present provisions and we consider that this is satisfactory.

21. Hospital engineers are responsible for the maintenance of many items of specialized equipment, and this responsibility must remain with the engineer even though specialized maintenance contracts with manufacturers may be entered into or manufacturers' technicians employed for specific maintenance purposes (e.g. on lifts, refrigeration plant, instrumentation, control systems and X-ray and sterilizer equipment).

22. Maintenance in hospitals must be organized and planned to avoid breakdown and interruption of essential services, and to avoid any upset or interference with conditions or processes which affect the treatment of patients. This is particularly important in the modern hospital and in the new hospitals now being planned, for, as indicated in paragraph 14, medical techniques are increasingly dependent on engineering. Moreover, it is essential to plan and organize the maintenance service in order to secure the highest possible efficiency in operation and the optimum economic life of plant, equipment and services in the face of rising fuel and capital costs. We find that in most hospitals " breakdown " maintenance is still the normal procedure although we recognize that in places some form of planned maintenance has been introduced.

23. We strongly advocate, therefore, the introduction of Planned Preventive Maintenance in all hospitals at the earliest possible date. It is only by adopting such a system that hospitals can be assured of both functional and economic efficiency and Planned Preventive Maintenance, as distinct from other forms of organized maintenance, will permit critical analysis of function and 'feed

back ' of information which may influence future design. Only by the introduction of Planned Preventive Maintenance can hospital engineers participate in the development of new equipment, where we think hospital engineers have an important role to play.

24. The hospital engineer must therefore have the technical and managerial capacity to plan and direct a system of Planned Preventive Maintenance involving the analysis of technical records, costing etc., and the ability to control the necessary staff to operate it.

25. In order to attract technically qualified applicants for hospital engineering posts, we consider that the service must provide a readily appreciated career structure. The young man wishing to make a career of engineering naturally looks at four things in considering which field of engineering he should enter; these are—

- (*a*) the satisfaction to be gained from the job itself;
- (*b*) prospects of advancement;
- (*c*) the facilities offered to enable him to equip himself to reach the highest posts; and
- (*d*) remuneration.

We examine these in turn.

26. Hitherto, the functions of operation and maintenance have not generally attracted into the hospital service engineers of the calibre necessary for the modern hospital, but we believe that current developments in hospital engineering and the replacement of old hospitals under the Hospital Plan will encourage men of the required calibre to enter the service. The modern hospital, with its varied and complex plant and equipment should not only satisfy but should also present a challenge to the young engineer and afford valuable practical training for men whose ultimate goal is design.

27. However, the satisfaction to be derived from a job does not depend on interest alone: responsibility and status are equally important. Under the present Whitley Council agreement (P.T.B. Circular 51) a Superintendent Engineer is defined as " an officer who is fully and directly responsible to a Board of Governors or Hospital Management Committee " for the engineering services; but we are told that there are a number of Superintendent Engineers who can hardly be said to be fully and directly responsible to the Committee or Board since they exercise their responsibility only through the agency of another officer, usually the Group Secretary. In our view this is quite wrong; the Superintendent Engineer should be fully responsible for technical control and management of everything coming within his field, and he should always attend committee meetings when engineering matters, or other matters which may have engineering implications, are being discussed. We realize, of course, that hospital authorities themselves determine which officers should attend the various committee meetings and that in some cases the reason for non-attendance of the Superintendent Engineer may be that he lacks the personality or administrative ability to secure recognition as a chief officer (we hope that implementation of our recommendations will overcome this in the future); nevertheless we recommend that the Ministry of Health and Department of Health for

Scotland should take action to ensure that every hospital authority recognizes the Superintendent Engineer as a chief officer of the hospital group, and that, as such, he should attend all relevant committee meetings.

28. In considering the second question referred to in paragraph 25—prospects of advancement—we have to take into account—

(a) that each hospital authority is an employer and must itself continue to determine whom it should employ; and

(b) that Regional Engineers have no direct responsibility for the operation and maintenance of the engineering plant in hospitals.

In seeking to ensure that the best men get promotion, therefore, we have had to reject any idea which entails direction by Regional Hospital Board or Ministry, to a hospital authority on which engineer it should employ. Sir Noel Hall set out the problems of promotion procedure for administrative and clerical staff in Section V of the Report on the Grading Structure of Administrative and Clerical Staff, of which the following is an extract—

> "……. The absence of any central responsibility for scrutinising promotions, for planning training programmes and integrating them with job rotation, and for securing an orderly succession of experienced officers qualified for promotion, may well lead to inequalities of opportunity, to a maldistribution of manpower and to a widespread general feeling of dissatisfaction difficult to pin down but debilitating in its effects. Because of the absence in the hospital service of any central machinery in this particular field, what I have to say in the following paragraphs may well be unfamiliar and may perhaps appear to be unimportant to those who are accustomed to living wholly with the existing system. Nevertheless, I hope that some of the issues which I raise will be sympathetically considered and, if found useful, sincerely and purposefully pursued.
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> At the present time there is a danger that there will be virtually no interchange between officers in the service of Regional Boards, Boards of Governors, Management Groups and hospitals. Indeed, unless steps are taken deliberately and constantly to guard against this danger, there will in a few years be a series of closed groups of employment. I do not see any way by which formal safeguards can be set up against this danger. In the last analysis, the only safety rests in the prudence of Chairman of Boards, Boards of Governors and Management Committees, and in the development of co-operative relationships among their senior officers. These inevitably take time to grow.
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> At present it is the responsibility of nobody at any point in the system to know who are the promising men and women likely to carry the senior posts in the future. Appointing authorities have no means of knowing what candidates may be available when a post becomes vacant. At the same time, those who take a serious interest in the careers of their subordinates, usually one of the outstanding characteristics of a first-class administrator, have really little sound information to go upon in advising younger men and women where and how to specialise and in what direction to widen their experience………"

29. Sir Noel Hall recommended that registers of administrative and clerical staff should be compiled and maintained on a regional basis; he was of the opinion that this would solve some of the problems of promotion planning and procedure which he had enumerated. This recommendation has been implemented and although we have been told that the registers are not making a significant contribution to the solution of these problems, we doubt whether sufficient time has elapsed to pass judgment on the value of these registers.

30. The problems of promotion planning and of providing attractive prospects of advancement are the same for hospital engineers as for administrative and clerical staff. We consider that a comprehensive system of planned promotion can only be achieved if a homogeneous engineering service is established with integration of the services of Regional Hospital Boards with those of Hospital Management Committees and Boards of Management. However, we have no doubt that the prospects of advancement of engineers with the appropriate qualifications and experience will be improved if, when a post becomes vacant, hospital authorities are given the means of knowing at least what suitable men are already working for other groups in the Region. We consider that responsibility for advising hospital authorities of suitable men who might be interested in competing for appointments should be given to Regional Engineers and we recommend that, in each Region, a register of all engineers working in hospitals within that Region should be compiled and kept up-to-date. The register should contain factual information only but, because of the small numbers involved in one Region, we would expect a Regional Engineer to know the promising men in the Region and also to know of outstanding men in other Regions. We recommend, also, that hospital authorities themselves should take positive action by giving suitable men in the Region notice of vacancies which arise in their employment, thus encouraging them to compete. We think that this procedure would go some way to assuring hospital engineers that they are not being overlooked; it would also help to convince potential hospital engineers that there are good prospects of advancement within the service for the man with ability. The present practice of advertising widely all vacancies should of course continue so that the best available talent from within and outside the service may be selected.

31. In order that candidates should be assured that full weight will be given to their qualifications and experience, we consider it essential that there should always be a technical assessor present when candidates for appointment are being selected and interviewed. We recommend that this assessor should be the Regional Engineer or an engineer nominated by him. The assessor must be the technical adviser to the appointments committee and not merely an observer. In this way the best possible engineering advice on the merits of the candidates will be made available to the hospital authorities and the efficiency of the engineering services raised.

32. There is another matter affecting promotion prospects which we should mention: it has been said that there is a barrier preventing movement of engineers between hospitals and Regional Hospital Boards. We have failed to find such a barrier except that imposed by the differing qualifications necessitated by differing responsibilities, and we know of several hospital engineers who have obtained Regional Board appointments. We are entirely in favour of movement between hospitals and Boards; each field can contribute something to the other

and it is most important, as we have already said, that there should be as close co-ordination as possible compatible with the organization of the National Health Service. We doubt whether there are any specific measures that can be taken to secure this, for it is more a habit of thought that is needed, at all levels, of looking upon the hospital engineering services as a whole.

33. Dealing with the third point which we mentioned in paragraph 25, we believe that the present arrangements for post-entry training of hospital engineers are both inadequate and little appreciated. There is no organized training scheme for men coming into the service, the only provision being rules, made in 1954, governing the financial assistance which can be given to men who take training of their own initiative with the approval of the hospital authority. In our view, post-entry training for hospital engineers is necessary and to attract good men, the facilities for further training must be comparable with those offered outside the National Health Service. The recommendations which we make in the next Section are designed to secure this, and are, we believe, in accordance with the Government's views on technical education as expressed in the White Paper " Better Opportunities in Technical Education ".

34. The fourth matter which influences a young man in his choice of field in engineering is remuneration. Many of those who gave evidence before us and of those—medical officers, administrators, and members of Boards and Committees as well as engineers—with whom we spoke on our visits, represented that the present level of remuneration is inadequate to recruit and retain men of the necessary calibre. We feel it our duty to draw attention to this body of opinion, although it has not been within our competence to investigate it. It is axiomatic that the level of remuneration should be commensurate with the responsibilities carried.

35. Our attention was also drawn to the dissatisfaction with the present method of assessing different levels of responsibility by reference to a system of counting beds or points. This does not fairly measure modern engineering responsibilities.

Section III—Detailed recommendations

GRADING STRUCTURE

36. We are aware that a number of hospital groups have more than one engineer directly responsible to the Hospital Management Committee or Board of Management for the engineering services within the group, different engineers—who may be graded Superintendent Engineer or Engineer-in-charge—being responsible for different hospitals. We believe that, in normal circumstances, maximum efficiency can only be achieved where the engineering services are managed and administered at hospital group level, which is the largest possible unit compatible with the present structure of the National Health Service; accordingly we recommend that there should be one engineer responsible to the Committee or Board for all the engineering services of all the hospitals in the group. We shall refer to him as Group Engineer.

37. If our recommendations are accepted, most Superintendent Engineers would become Group Engineers, but our proposals go further than this. At present there are a few hospital groups which do not qualify for a Superintendent Engineer, owing either to an insufficient number of beds within the group, or to the fact that there is no steam boiler plant in everyday use for the main services;

the chief engineer in such cases can only be graded as Engineer-in-Charge. We consider that although a group may be small the engineer responsible to the Committee or Board must exercise the same nature of responsibility in managing and administering the engineering services of the hospitals in the group, although its weight will be less than in a large group. The responsibilities of the Superintendent (or Group) Engineer are growing and the proportion represented by a steam boiler plant is diminishing; the presence of a steam boiler plant at a hospital as an important factor in grading is now out-of-date. We therefore consider that our recommendation on Group Engineers in the preceding paragraph should apply to all groups, irrespective of size, subject to our comments in the next paragraph.

38. There are wide differences in the size of hospitals groups and thus of the responsibilities of Group Engineers; the Whitley Council recognize this by a range of salary scales, and we expect that they will continue to do so. It follows that the larger groups generally have a wider choice of candidates for posts of Group Engineer and we think, therefore, that there might in certain circumstances be some advantage in adjacent small hospital groups being associated at the Group Engineer level, by having one Group Engineer responsible for both groups, enabling each group to have the services of a better engineer. Naturally a great deal must depend on circumstances, including the proximity of the hospitals of the two groups and the demands likely to be made upon the Group Engineer by each hospital authority; we therefore do not wish to be dogmatic about this point, but recommend that wherever opportunity arises, consideration should be given by Committees and Boards of small groups to making joint appointments of Group Engineers. This possibility of association of groups might also be considered both in relation to the engineering and tradesmen staff of the hospitals and to the appointment of specialist engineering personnel, such as electronic engineers, where the amount of work within one group might not justify such an appointment, but the total amount of work in several might well do so.

39. There is one further point on the duties of a Group Engineer on which we would like to comment. A Superintendent Engineer is at present required to be directly in charge of the engineering services of one of the hospitals of the group: we consider that the time of the Group Engineers in many large hospital groups will be fully absorbed in managing and administering the engineering services of those groups without having day-to-day responsibility for those of any particular hospital, and we therefore consider that this, as a requirement for appointment of a Group Engineer, should be dropped.

40. We do not propose to recommend any other changes in the grading structure; the existing grades of Senior Engineer and Assistant Engineer should continue, although the definition of both grades will require examination in the light of the diminishing importance of a steam boiler plant in the responsibilities of a hospital engineer and the need to ensure that an Assistant Engineer is always under the effective supervision of a senior grade of engineer; the grade of Engineer-in-Charge would, of course, disappear, all existing members of that grade being regraded to one of the other grades according to their responsibilities.

41. We have had representations that there should be a recognized grade of Deputy Group Engineer and we are aware that the Ministry of Health have

given approval to some such posts on an 'ad hoc' basis. We consider that there should be a recognized grade of Deputy Group Engineer, but that such appointments should only be made where the engineering management and responsibility merits or requires an engineer who would act for the Group Engineer over the whole range of his duties; neither an Assistant, nor a Senior Engineer who simply acts for the Group Engineer when he is away, should be graded as Deputy Group Engineer.

QUALIFICATIONS

General

42. Engineering installations and equipment are expensive capital items, and operation and maintenance must be carried out to maximum efficiency, not only to ensure that essential hospital services are provided without interruption but also to ensure that public money is not wasted. We consider it essential for the wellbeing of the National Health Service for hospital engineering to become a completely qualified service as soon as it is practicable, all engineers, without exception, having obtained the specified qualifications. This reflects no general change of principle, for under the present Whitley Council agreement it is envisaged that officers without the specified qualifications would only be appointed in exceptional circumstances or if they were 'protected' officers, i.e. officers in post at a given date when the particular qualification was first specified. We believe, therefore, that the time has come when consideration should be given to the practicability of withdrawing or modifying the present provisions to ensure that only engineers with the appropriate qualifications are appointed in the future.

43. We have come to the conclusion that the introduction of a specific qualification in hospital engineering would not be justified. We think that hospital engineering cannot be looked upon as a clearly defined branch of engineering and we consider that nationally recognized technical qualifications to which is added specialized hospital training (which we refer to later) meet fully the needs of the hospital service.

Group Engineers

44. We recommend that the Higher National Certificate in mechanical or electrical engineering with endorsements which ensure that all men have mechanical and electrical qualifications and the elements of industrial organization and management, be regarded as the minimum technical qualification for Group Engineer in all the medium-sized and larger groups. In hospital groups of lower engineering responsibilities we consider that the City and Guilds Certificate in Plant Engineering should be the minimum acceptable qualification for the post of Group Engineer; we suggest that this qualification should be acceptable for Group Engineers in hospital groups which have a pointage of 10 or less on the present basis. (We are using the present unsatisfactory pointing system merely as an indication of the level of engineering responsibility we have in mind).

45. In cases where a teaching hospital in England and Wales uses its chief engineer widely in the design and development of new works and as liaison with engineering consultants, we consider it essential that he should be a professional engineer (see Appendix B).

Senior Engineer

46. We consider that the minimum qualifications for Senior Engineers in posts having a pointage under the present system of more than 20 should be the same as those for Group Engineer in the over 10 points field i.e. the Higher National Certificate in mechanical or electrical engineering with appropriate endorsements. Where the pointage of the post on the present basis is 20 or less we consider that the City and Guilds Certificate in Plant Engineering should be the minimum qualification. The quality of the men who obtain the City and Guilds Certificate in Plant Engineering should be kept under review to determine whether there should be any adjustment to the dividing line.

Assistant Engineer

47. At the moment no technical qualifications are specified for Assistant Engineers for posts up to 1,500 beds, although "it is desirable that new entrants should possess one of the recognised technical qualifications and where they do not, the employing authority should encourage them to undertake study leading to such a qualification". (Extract from Whitley Council Circular PTB 51). We believe that it is in the interests of the Health Service that this grade be looked upon as a starting point for the young engineer aiming to make a future in hospital engineering and not as the apex of a career of a good craftsman without technical qualification. We recommend that a minimum qualification should be specified for the Assistant Engineer grade of Ordinary National Certificate in Engineering. The requirement of Ordinary National Certificate for this grade also dovetails with certain of our proposals on training, to which we now turn.

TRAINING AND EXPERIENCE

48. Training for hospital engineers falls under three main heads:—

(*a*) training and experience prior to entry into the National Health Service;

(*b*) training on entry into the Health Service; and

(*c*) further training for staff in post.

(*a*) *Training and Experience prior to entry into the National Health Service*

49. One of the requirements in P.T.B. Circular 51 is that all hospital engineers "must have completed an apprenticeship in mechanical engineering (as distinct from a wholly craft apprenticeship) or have otherwise acquired a thorough practical training in mechanical engineering". We consider that entry to the hospital service should not be restricted to men who have served an apprenticeship in mechanical engineering; the hospital service would benefit by having some engineers who have served apprenticeships in electrical engineering (particularly light electrical engineering). We also recommend that the present wording of the Whitley Council agreement "or have otherwise acquired a thorough practical training" be broadly interpreted so that the man who has served a craft apprenticeship and has obtained academic qualifications is not rejected. We believe that the hospital service cannot provide an engineering apprenticeship of a quality comparable with that offered by industry, where a much wider basic training can be given.

50. Engineers appointed to grades above Assistant Engineer should have had practical experience of types of plant and equipment similar to those found in the hospital service and have acquired a knowledge of management and administration.

(*b*) *Training on entry into the National Health Service*

51. Although we consider that hospital engineering should not be looked upon as a distinct and separate branch of engineering there is a considerable amount of plant, equipment, engineering techniques and procedures in the modern hospital which has special features and presents special problems which are new to all engineers coming into the hospital service for the first time; they clearly must be trained in these matters. New entrants must also become familiar with hospital administration and understand the relationships between hospitals, Hospital Management Committees and Regional Hospital Boards. The content and extent of training needed will naturally be different for the man who is already a trained and experienced engineer, from that which should be given to a young man who comes in immediately after he has completed initial engineering training, and we deal with these two types of training separately.

(i) *Training for the young engineer*

52. The young man who has only just completed his basic engineering training and obtained his O.N.C. will not be a fully effective member of the staff. He needs comprehensive instruction coupled with opportunities of practical experience in all aspects of engineering appropriate to the hospital service. He should, in fact, continue his engineering education focussed on the specific field of hospital engineering. He needs to acquire a knowledge of management and administration and we would expect his training to include visits to and/or attachment to other hospitals. Training should also include a short period in the Regional Hospital Board engineering department.

53. During this training period the young engineer must be offered every facility and encouragement to study for higher qualifications (e.g. Higher National Certificate) by day or block release, and so equip himself for eventual appointment to Senior and Group Engineer posts. The Higher National Certificate course by day release lasts at least two years and clearly, therefore, it might be preferable to arrange a central block release course for this qualification, which would shorten the period of training and also secure a bias towards hospital engineering in the content of the course. We think that this possibility should be explored by the Ministry of Health and the Department of Health for Scotland.

54. These facilities for studying for higher qualifications must also be given to Assistant Engineers who enter the hospital service with some experience, particularly where they are under 30 years of age.

(ii) *Specialized training*

55. We consider it essential that all engineers coming into the hospital service for the first time (irrespective of the grade to which they are appointed) be given, as soon as possible after entry, thorough training in hospital plant and equipment, and hospital engineering techniques and procedures. They should also be given training in hospital administration as it relates to engineering. Examples of subjects which should be included in the training programme are given at Appendix C. During the training the engineer would remain an effective member of the engineering staff of the hospital or group to which he was appointed but it would be essential for hospital authorities to release their engineers for the training sessions. We think that such training can best be initiated and con-

trolled by the Ministry of Health and the Department of Health for Scotland in view of the small numbers involved in any one Region and can be integrated with the training which we recommend for the young engineer in the previous paragraphs.

56. To ensure that the training outlined in paragraphs 51 to 54 is given, the number of Assistant Engineer posts must be appropriately increased.

(c) *Training for staff in post*

57. We consider that all hospital engineers now in post holding or studying for the Ordinary National Certificate should be offered the same technical training facilities as those we recommend for new entrants in paragraph 53 above.

58. We are aware that there are already provisions which enable engineers to be given study leave and financial assistance by employing authorities, in certain cases after the sanction of the Regional Hospital Board or Ministry has been obtained—a copy of those provisions is at Appendix D; but we believe that little advantage has in the past been taken of these facilities. We consider that these provisions should be made known to all hospital engineers and potential hospital engineers. Furthermore, we think that the facilities themselves should be re-examined by the Ministry to ensure that they accord with current philosophy as regards study leave and financial assistance.

59. We have previously mentioned that in our view the engineering responsibilities of Regional Hospital Boards and those of Hospital Management Committees should not be considered as rigid, separate entities, and a close link between them should be established. We believe that much can be done to this end by arrangements being made between Regional Hospital Boards, and Hospital Management Committees and Boards of Management for the secondment of hospital engineers to Boards for given periods and vice-versa, possibly on a temporary exchange basis. By this arrangement close liaison is facilitated, and occasionally a flair for design work may be revealed by the hospital engineer, leading eventually to his appointment with a Regional Hospital Board. This is particularly important as regards the young engineers referred to in paragraphs 52 to 54 above, for we think that it is essential to let the ambitious man perceive that experience in hospitals can lead to selection for a Regional Hospital Board appointment, and ability should be allowed to find the outlet where it can be used to the fullest extent.

60. At least one Regional Hospital Board has arranged in the past two years an annual conference of senior hospital engineers in its region, lasting about a week, in which talks are given and views exchanged on matters of common interest to hospital engineers. We think this is a good thing and we recommend that other Boards should consider arranging similar courses for their engineering staff. Such courses are a valuable method of keeping staff abreast of development and of stimulating new ideas, which is essential if the hospital engineering services are to work positively and progressively. For the same reason, we consider that every opportunity should be given and taken for hospital engineers to visit manufacturers of any special plant and equipment with which they have to deal.

Concluding Remarks

61. Until comparatively recently the load falling upon the engineer has largely arisen from the operation and maintenance of relatively straightforward apparatus providing the services of heating, lighting and ventilation. Modern standards, however, demand levels of performance and reliability obtainable only by the use of sophisticated plant. Its operation and maintenance at the minimum of cost and the maximum of efficiency requires a high degree of engineering management and skill.

62. Not only has the engineer of to-day to compete with ever-increasing complexity in providing the traditional services of hospitals, but to a growing extent he contributes to the treatment, as well as to the comfort and wellbeing of the patient. He maintains devices essential for the application of medical science, and co-operates with the hospital staff in the development of apparatus and techniques.

63. The adoption of our recommendations will, we believe, strengthen the engineering resources of hospitals, lead to a better appreciation by doctors and administrators of the constructive support which engineers can give, and therefore benefit both patient and taxpayer.

64. Nevertheless we are convinced that to exploit fully the engineer's potential contribution to a progressive hospital service, an integrated engineering organization within the National Health Service will have to be created. We hope that this conviction will be borne in mind should any future enquiry be held into aspects of the National Health Service wider than those given to us to study.

65. The following is a summary of our main recommendations:—

Duties and Status

(1) Hospital engineers should continue to be given responsibility for minor capital work and site supervision of capital works under certain conditions (paragraphs 15 to 18).

(2) Where there is a Building Supervisor, the Superintendent Engineer should not hold technical responsibility for building work; any managerial responsibility held by a Superintendent Engineer should be confined to securing co-ordination (paragraph 19).

(3) Planned Preventive Maintenance should be universally adopted (paragraph 23).

(4) Action should be taken to ensure recognition of the Superintendent Engineer as a chief officer of a hospital group and his attendance at relevant Committee meetings (paragraph 27).

(5) A central register of engineers in each Region should be maintained at the Regional Hospital Board (paragraph 30).

(6) The Regional Engineer or his nominee should sit on appointments boards for selection of hospital engineers (paragraph 31).

Grading

(7) There should be a Group Engineer directly responsible to each Hospital Management Committee for the engineering services of the group (paragraphs 36 and 37).

(8) Consideration should be given to the association of small hospital groups with a view to the appointment of one Group Engineer, and other engineering staff (paragraph 38).

(9) A Group Engineer should not be required to have a day-to-day responsibility for the engineering services of any particular hospital and the definitions of other grades should be examined (paragraphs 39 and 40).

(10) There should be a recognized grade of Deputy Group Engineer (paragraph 41).

Qualifications

(11) The present provisions relating to the appointment of engineers without the requisite technical qualifications should be reconsidered (paragraph 42).

(12) The Higher National Certificate in engineering, with appropriate endorsement, should be recognized as the minimum acceptable qualification for Group Engineer in the medium and large groups, with the City and Guilds Certificate in Plant Engineering as the minimum qualification for post of Group Engineer in small hospital groups (paragraph 44).

(13) The minimum qualification for Senior Engineer should be the City and Guilds Certificate in Plant Engineering, except that for the more important posts the Higher National Certificate in engineering, with appropriate endorsements, should be the minimum qualification (paragraph 46).

(14) The minimum qualification for Assistant Engineer should be Ordinary National Certificate in engineering (paragraph 47).

Training

(15) Entry should not be restricted to men who have served an apprenticeship in mechanical engineering (paragraph 49).

(16) Comprehensive training should be given to young engineers entering the service having the Ordinary National Certificate; the training should include study, by day or block release, for higher technical qualifications e.g. the Higher National Certificate (paragraphs 52 to 54). The same facilities should be offered to engineers now in post holding or studying for the Ordinary National Certificate (paragraph 57).

(17) All engineers recruited from outside should be given specialized training in hospital equipment, procedures and techniques (paragraph 55).

(18) The present provisions regarding study leave and financial assistance should be re-examined (paragraph 58).

(19) Secondment of hospital engineers to Regional Hospital Boards is suggested (paragraph 59).

(20) Refresher courses and conferences should be instituted (paragraph 60).

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J. F. LYNE
M. H. ROSSINGTON
W. RUSSELL

J. E. KING (*Secretary*)

16th February, 1962

Appendix A

Organizations from whom evidence was received

1. †Association of Building Technicians.
2. *Association of Hospital Management Committees.
3. †Association of Hospital Superintendent Engineers (Metropolitan and Wessex Regional Hospital Boards).
4. †Association of Supervising Electrical Engineers.
5. †Association of Supervisory Staffs Executives and Technicians.
6. City and Guilds of London Institute.
7. Institution of Electrical Engineers.
8. Institution of Engineers-in-Charge.
9. Institution of Heating and Ventilating Engineers.
10. †Institute of Hospital Administrators.
11. †Institution of Hospital Engineers.
12. †National and Local Government Officers' Association.
13. †National Association of Hospital Management Committee Group Secretaries.
14. †National Union of Public Employees.
15. †Regional Hospital Board Engineers' Association.

†—Written evidence supplemented by oral discussion.

*—Oral evidence only.

The Institution of Mechanical Engineers

Professional Engineer and Engineering Technician

(Issued by the Council for the guidance of sponsors of applications for Corporate Membership of the Institution)

The following definitions have been adopted by the Engineering Societies of Western Europe and the U.S.A. (EUSEC) for the purposes of Conference discussions. It is in the spirit of these that the Council interpret the By-laws relating to election or transfer to Corporate Membership, in particular the definition of the term " post of professional responsibility in mechanical engineering ".

PROFESSIONAL ENGINEER

A professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the analysis and solution of engineering problems. He is able to assume personal responsibility for the development and application of engineering science and knowledge, notably in research, designing, construction, manufacturing, superintending, managing and in the education of the engineer. His work is predominantly intellectual and varied, and not of a routine mental or physical character. It requires the exercise of original thought and judgment and the ability to supervise the technical and administrative work of others.

His education will have been such as to make him capable of closely and continuously following progress in his branch of engineering science by consulting newly published work on a world-wide basis, assimilating such information and applying it independently. He is thus placed in a position to make contributions to the development of engineering science or its applications.

His education and training will have been such that he will have acquired a broad and general appreciation of the engineering sciences as well as a thorough insight into the special features of his own branch. In due time he will be able to give authoritative technical advice, and to assume responsibility for the direction of important tasks in his branch.

ENGINEERING TECHNICIANS

An engineering technician is one who can apply in a responsible manner proven techniques which are commonly understood by those who are expert in a branch of engineering, or those techniques specially prescribed by professional engineers.

Under general professional engineering direction, or following established engineering techniques, he is capable of carrying out duties which may be found among the list of examples set out below.

In carrying out many of these duties, competent supervision of the work of skilled craftsmen will be necessary. The techniques employed demand acquired experience and knowledge of a particular branch of engineering, combined with the ability to work out the details of a task in the light of well-established practice.

An engineering technician requires an education and training sufficient to enable him to understand the reasons for and purposes of the operations for which he is responsible.

The following duties are typical of those carried out by engineering technicians:—

> Working on design and development of engineering plant and structures; erecting and commissioning of engineering equipment and structures; engineering drawing; estimating, inspecting and testing engineering construction and equipment; use of surveying instruments; operating, maintaining and repairing engineering machinery, plant and engineering services and locating defects therein; activities connected with research and development, testing of materials and components and sales engineering, servicing equipment, and advising consumers.

Appendix C

EXAMPLES OF SUBJECTS WHICH SHOULD BE INCLUDED ON COURSES OF TRAINING FOR ENGINEERS WHO ARE NEW ENTRANTS TO THE HOSPITAL SERVICE

1. Planned Preventive Maintenance
2. Costing Analysis
3. Operational recording
4. Laundry and Kitchen Engineering
5. X-ray Equipments & Processing
6. Electro-Medical Servicing
7. Sterilizing Equipment and Processes
8. Communication Systems
9. Electrical safety
10. Medical Gases, Compressed Air and Vacuum Techniques
11. Hospital Administration
12. Hospital Management Committee—Structure & Administration
13. Regional Hospital Board and Ministry Structure & Administration
14. Specialist courses on complex equipment, usually at manufacturer's works.

Extract from H.M. Circular (54) 55 *dated June*, 1954

PROFESSIONAL AND TECHNICAL WHITLEY COUNCIL 'B'

Special Leave and Expenses for Post-Entry Training purposes for certain professional and technical staff.

1. *Granting of leave and expenses.* Applications for study leave and expenses are, in the first instance, matters for consideration by the employing authorities. The Minister is of the opinion, however, that some broad uniformity is desirable in this connection and for this reason has decided that in certain circumstances—as indicated in the table below—the prior approval of the Regional Board or the Minister or both should be obtained.

Period of Leave	*Type of Leave*	*Remarks*
(A) Up to 13 weeks.	(i) Without pay or expenses.	At discretion of employing authority.
	(ii) With pay but no expenses.	At discretion of employing authority.
	(iii) With pay and travelling and subsistence expenses. (For the sitting of examinations see paragraph 2 below).	For an employee of a Hospital Management Committee the prior consent of the Regional Hospital Board is required.
(B) Over 13 weeks.	(i) Without pay or expenses. (ii) With pay but not expenses. (iii) With pay and travelling and subsistence expenses. (For the sitting of examinations see paragraph 2 below).	For an employee of a Hospital Management Committee the prior consent of the Regional Hospital Board is required in all cases. Except for periods of special leave without pay or expenses of less than twelve months, the Minister's prior consent should be obtained unless the case is one within a class for which he has already given general authority.

2. *Expenses in connection with examinations; expenses of other kinds*

The above references to expenses do not apply to travelling and subsistence expenses for the sitting of examinations nor to expenses or fees of any other kind. Whenever an employing authority proposes to pay:—

(*a*) travelling and subsistence expenses for the sitting of examinations

or

(*b*) expenses or fees of other kinds, e.g. course fees

the Minister's prior consent should be sought.

To:—Regional Hospital Boards,
Hospital Management Committees,
Boards of Governors.

16
1962

Printed in England under the authority of Her Majesty's Stationery Office
by the Crewe Stationery Co. Ltd.
401 Wt. No. 2572 D. No. 9446 K28 5/62

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Published by
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MINISTRY OF HEALTH
SCOTTISH HOME AND HEALTH DEPARTMENT

Report of the Study Group on the Work, Grading, Training and Qualifications of Hospital Engineers

16
1962

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